Space Weather Technical Forecast

Issued on Tuesday, 05 July 2022 at 01:10 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of isolated G1/Minor Storms, mainly on Days 1 and 2 (5th and 6th).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low, with an isolated C5.1 flare from AR3050 at 04/1333UTC.

There are currently five numbered sunspot regions on the disc. AR3046, located in the northeast quadrant, remains the largest spot but remains largely stable and inactive. AR3050 which is situated just east of AR3046 was the source of the C5 flare. However, it contains just a few small spots and continues to decay. Other spot groups are small and magnetically simple, with only small changes apparent in recent imagery. A possible new spot group is emerging near the northeast limb.

A possible CME associated with the C5 flare has yet to be assessed, pending updated imagery, and could potentially have a partial Earth directed component. Otherwise, no other Earth-directed CMEs were observed in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind, as observed at L1 by DSCOVR, increased erratically from around 350km/s to near 480km/s for a time during the afternoon UTC of the 4th, before decreasing back towards 400km/s on the most recent observations. Density showed an overall erratic downward trend, with early peaks near 60ppcc to eventually lower back to average levels 5-10ppcc. The IMF was at moderate levels for much of the UTC day, with a peak of 20nT, before returning to weak levels in recent hours. The north-south component ranged between +17 and -13nT, with some sustained spells of negative Bz at the start of the period, and during the UTC afternoon. The phi angle was mainly negative (towards the sun). The above parameters likely indicated ongoing weak CME enhancement for much of the period, before waning towards the end of the day.

Geomagnetic activity was mainly Unsettled to Active, with a G1/Minor Storm interval recorded 04/0300-0600UTC.

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) as measured by GOES16 remained at Background levels throughout the period.

The high energy electron flux (greater than 2MeV) has been predominantly at Normal Background levels through the last 24 hours. Electron fluence was well below the Active (1e8 integrated pfu) threshold. Observed fluence was 1.27e6 integrated pfu at 05/0001UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be generally Very Low or Low, with a daily chance of further C-class flares. An uptick in activity is probable from the middle of the week as returning

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regions potentially cross onto the eastern limb.

Solar Wind / Geomagnetic Activity: A possible slow CME from 29 June may glance Earth on Day 1 (5th July), however confidence is very low with no significant impacts currently anticipated given the slow speed and lengthy transit time involved. No other Earth-directed CMEs currently feature in the forecast. However, a possible CME associated with the C5 flare on 4th has yet to be assessed, pending updated imagery, and could potentially have a partial Earth directed component.

Otherwise, solar winds are anticipated to increase from the current slightly elevated levels to elevated levels at times over the next 2 or 3 days as CH97/+ becomes geoeffective. Late in the period solar winds should trend downwards again.

Geomagnetic activity is anticipated to begin mainly Quiet to Unsettled, with a decreased chance of further isolated Active intervals. Activity is then anticipated to rise again to Unsettled to Active conditions later on the 5th as CH97/+ becomes increasingly geoeffective, with a Chance of G1 being reached. Similar conditions are expected into Day 2 (6th), with a gradual waning trend then likely through Days 3 and 4 (7th and 8th).

Energetic Particles / Solar Radiation: In the absence of any significant sunspot development, the high energy proton flux (greater than 10 MeV) is expected to remain at Background levels. High energy electron flux (greater than 2MeV) is expected to be mainly Normal Background at first. However, there is a likely increasing chance of high (1e3 pfu) flux levels being reached during the forecast period due to anticipated high speed stream influence. Electron fluence is considered most likely to remain below the Active (1e8 integrated pfu) threshold, but with an anticipated rising trend.

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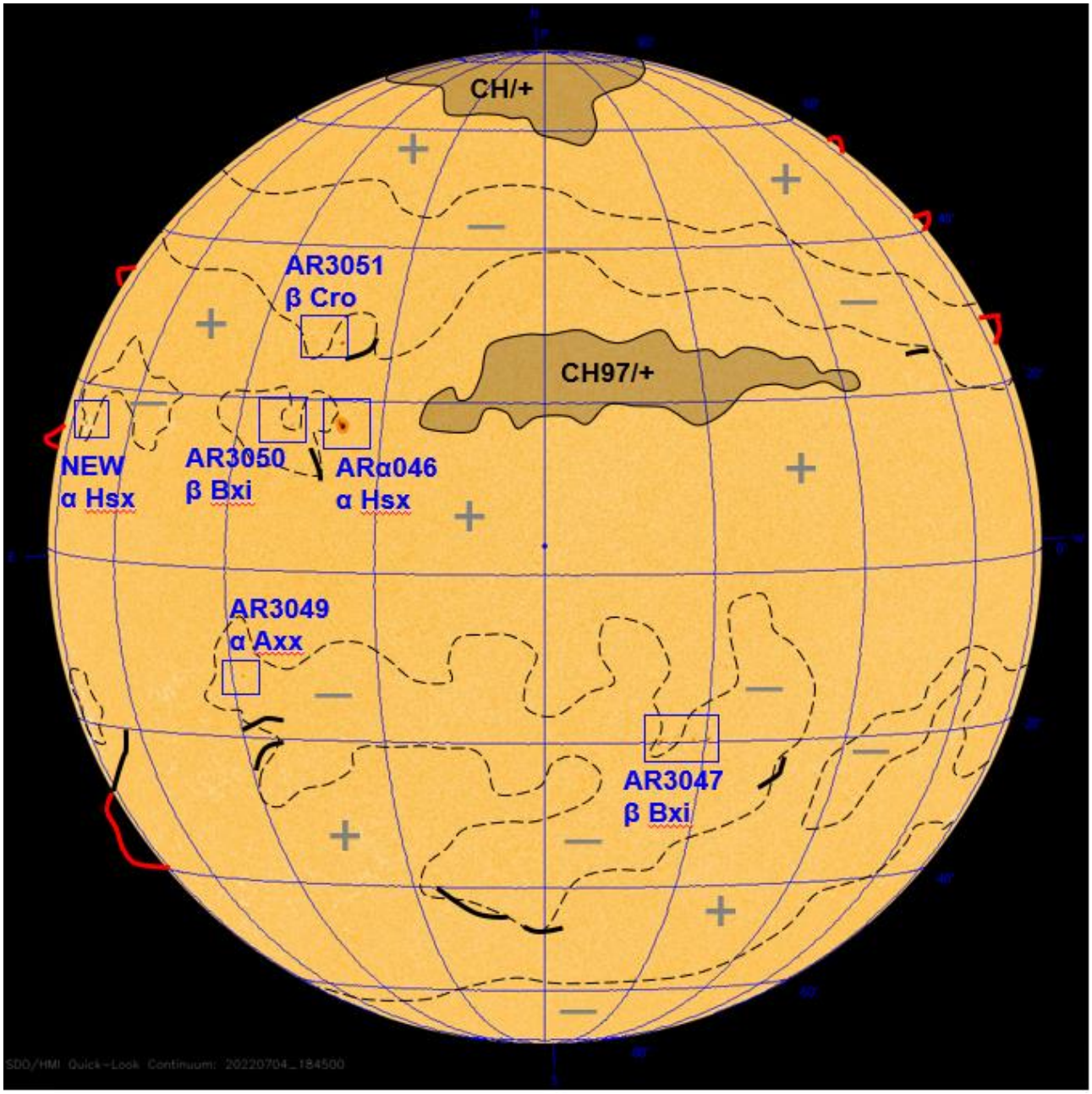
Figure 1. Solar Analysis Valid 04/1900UTC.



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Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A possible slow CME from 29 June may glance Earth on Day 1 (5th July), however confidence is very low with no significant impacts currently anticipated given the slow speed and lengthy transit time involved. No other Earth-directed CMEs currently feature in the forecast. However, a possible CME associated with the C5 flare on 4th has yet to be assessed, pending updated imagery, and could potentially have a partial Earth directed component.

Otherwise, solar winds are anticipated to increase from the current slightly elevated levels to elevated levels at times over the next 2 or 3 days as CH97/+ becomes geoeffective. Late in the period solar winds should trend downwards again.

Geomagnetic activity is anticipated to begin mainly Quiet to Unsettled, with a decreased chance of further isolated Active intervals. Activity is then anticipated to rise again to Unsettled to Active conditions later on the 5th as CH97/+ becomes increasingly geoeffective, with a Chance of G1 being reached. Similar conditions are expected into Day 2 (6th), with a gradual waning trend then likely through Days 3 and 4 (7th and 8th).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	30	30	20	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
29/1903	Partial	Filament	N18W000	200km/s	5th July	Vert low confidence

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Met Office Space Weather Technical Forecast

Radio Blackouts - X-Ray Flares:

Solar activity was Low following an isolated C5.1 flare from AR3050 at 04/1333UTC. There are currently five numbered sunspot regions on the disc. AR3046, located in the northeast quadrant, remains the largest spot but remains largely stable and inactive. AR3050 which is situated just east of AR3046 was the source of the aforementioned C5 flare. However, it contains just a few small spots and continues to decay. Other spot groups are small and magnetically simple, with only small changes apparent in recent imagery. A possible new spot group is emerging near the northeast limb.

A couple of bright flux regions are apparent near the eastern edge of STEREO A EUVI imagery which may correspond to possible returning regions which are likely to rotate onto the Earth-facing disc around midweek. The outlook is therefore for a greater risk of flares with time, however the degree to which this occurs will be assessed after any arrivals over the eastern horizon.

Solar activity is forecast to be Very Low to Low, with a daily Chance of further C-class flares, and a very slight chance for an M-flare.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	5	5	5
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is currently at background levels, and will most likely remain at this level through the period, in the absence of any significant sunspot development.

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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High Energy Electrons Event (≥ 2MeV):

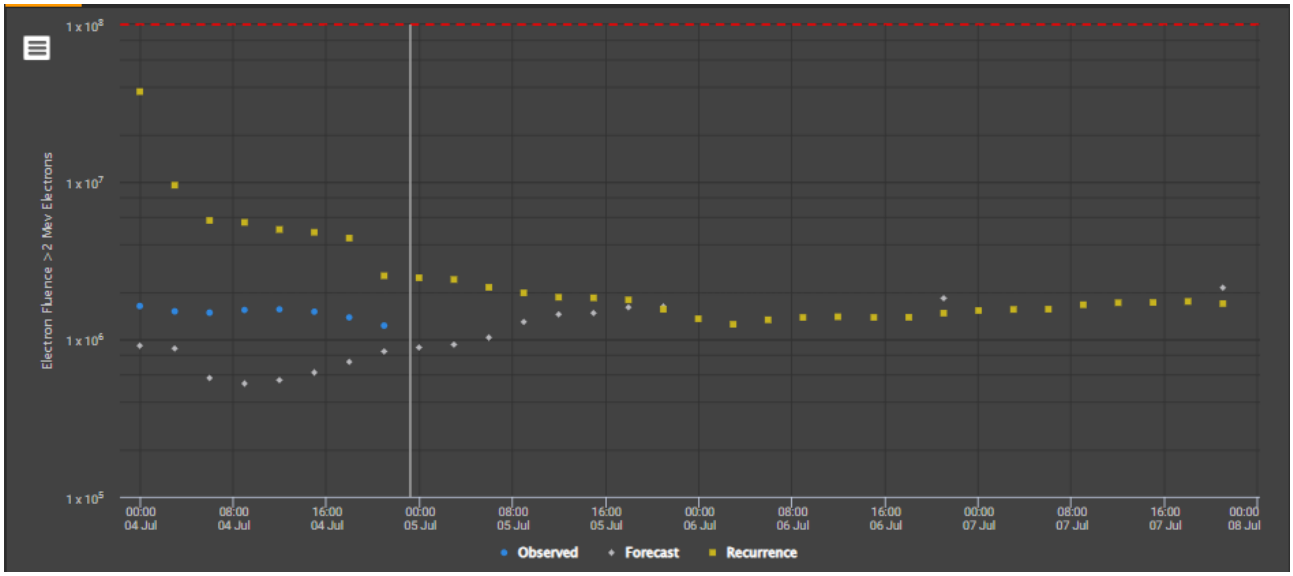
The high energy electron flux (greater than 2MeV) has been at mainly background levels. Electron flux is likely to oscillate between background and moderate levels, at least initially. However, there is a likely increasing chance of high (1e3 pfu) flux levels being reached during the forecast period due to anticipated high speed stream influence of CH97/+.

Electron fluence is currently well below the Active threshold. Fluence is currently considered most likely to remain below the Active threshold through the period, although this carries a degree of uncertainty due to the significant difference in coronal hole extent compared to the previous rotation. An upward trend is assessed as being likely following anticipated coronal hole connection but with low confidence for the magnitude of this.

Recurrence is not considered to be a very good guide at present, and REFM maintains very low Fluence values, with no upward trend, which may be a little deficient.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	5	10	30	30
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	5	5

Figure 2: MOSWOC REFM



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